Exemption No. 6076

UNITED STATES OF AMERICA
DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
RENTON, WASHINGTON 98055-4056

In the matter of the petition of

Boeing Commercial Airplane Group **Regulatory Docket No. 28029**

for an exemption from §§ 25.841(a) and
25.1447(c)(1) of the Federal Aviation
Regulations

GRANT OF EXEMPTION

By letter B-T02R-94-1519 dated December 22, 1994, K. K. Usui, Manager, Certification, Boeing Commercial Airplane Group, P.O. Box 3707, Seattle, WA 98124-2207, petitioned for an exemption from the cabin pressure altitude limit requirement of § 25.841(a) of the Federal Aviation Regulations (FAR), and the § 25.1447(c)(1) requirement that the passenger oxygen masks be automatically presented before the cabin pressure altitude exceeds 15,000 feet.

Sections of the FAR affected:

> Section 25.841(a) states, "Pressurized cabins and compartments to be occupied must be equipped to provide a cabin pressure altitude of not more than 8,000 feet at the maximum operating altitude of the airplane under normal operating conditions. If certification for operation over 25,000 feet is requested, the airplane must be able to maintain a cabin pressure altitude of not more than 15,000 feet in the event of any reasonably probable failure or malfunction in the pressurization system."

ANM-95-008-E

Section 25.1447(c)(l) states, "There must be an oxygen dispensing unit connected to oxygen supply terminals immediately available to each occupant, wherever seated. If certification for operation above 30,000 feet is requested, the dispensing units providing the required oxygen flow must be automatically presented to the occupants before the cabin pressure altitude exceeds 15,000 feet and the crew must be provided with a manual means to make the dispensing units immediately available in the event of failure of the automatic system."

The petitioner's supportive information is as follows:

"A Chinese airline is planning to provide service to Bamda (Bangda), China utilizing Boeing 757-200 airplanes. The airport in Bamda is at an elevation of 14,219 feet above sea level (excluding barometric pressure variations). The 757 is currently certified for operation at a maximum airport altitude. of 13,300 feet at La Paz, Bolivia. To provide for additional capability up to an airport altitude of 14,219 feet, the current 757 Cabin Pressure Control System (CPCS) and passenger cabin oxygen system will require modification. These modifications would allow the cabin internal pressure altitude to reach 16,000 feet in the event of a CPCS failure, which is a low probability event. The FAA limit of 15,000 feet for cabin internal pressure altitude is specified in FAR 25.841(a) and FAR 25.1447(c)(l).

"The Boeing Company requests an exemption from FAR 25.841(a) and FAR 25.1447(c)(l) in order to provide 757 capability for an airport elevation of 14,219 feet. The following is a Public Interest Statement and Factors Supporting the Petition.

"PUBLIC INTEREST STATEMENT

Granting of this exemption would permit the Chinese government to develop a region which is under developed because its terrain makes access by ground vehicles extremely difficult. Airline service utilizing the Boeing Model 757-200 would promote development of the region by providing ready access to this region. Furthermore, this will promote the sale of Boeing airplanes in China.

The 757 can provide service to Bamda, at elevation 14,219 feet, if the CPCS and the oxygen system are permitted to provide oxygen at a maximum cabin pressure altitude of 16,000 feet instead of 15,000 feet if the CPCS fails. Note that during normal operation, the cabin pressure altitude should not exceed the airport elevation of 14,219 feet -- which is below the 15,000 feet FAR limit.

"FACTORS SUPPORTING THE PETITION

There is little or no increased risk to passengers because of three factors:

1. Exposure of passengers to a cabin pressure altitude of 16,000 feet occurs only if the CPCS fails;

2. The CPCS failure rate meets FAA requirements; and

3. Even if the CPCS fails, the flight crew can manually deploy oxygen to passengers if necessary.

"A system description and supporting rationale is provided below for both FAR paragraphs [from which exemption is requested].

"Exemption from FAR 25.841(a)

FAR 25.841(a) states that pressurized cabins and compartments must be equipped to provide a cabin pressure altitude of not more than 8,000 feet at the maximum operating altitude of the airplane under normal operating conditions. FAR 25.841(a) also states that if certification for operation over 25,000 feet is requested, the airplane must be able to maintain a cabin pressure altitude of not more than 15,000 feet in the event of any reasonably probable failure or malfunction in the pressurization system.

The 757 Cabin Pressure Control System (CPCS) has two pressure altitude switches in the automatic pressure controller to prevent the CPCS from exceeding 15,000 feet in the event of any reasonably probable failure or malfunction in the pressurization system. The pressure switch is set at 11,000 feet +/- 500 feet for operating into airports at or below 9,500 feet and at 14,500 feet +/- 500 feet for airports above 9,500 feet. Operation into Bamda Airport would require a new pressure altitude switch, set at 15,000 feet +/- 300 feet, to avoid loss of cabin pressure control.

The current pressure switch set-point for operating into airports above 9,500 feet is inadequate for operating into Bamda Airport. The margin between the Bamda Airport elevation (14,219 feet) and the pressure switch set-point (14,500 feet +/- 500 feet) is not sufficient to ensure that the switch will not activate upon landing. If activated, the airplane may land pressurized resulting in the delay of opening the doors until the airplane is depressurized. A delay in the opening of the doors in an emergency evacuation should be prevented. The new set-point prevents such a delay for airports at 14,219 feet.

An exemption to FAR 25.841(a) is being requested from the FAA for operation into Bamda Airport. FAR 25.841(a) states "if certification for operation over 25,000 feet is requested, the airplane must be able to maintain a cabin pressure altitude of not more than 15,000 feet in the event of any reasonably probable failure and malfunction in the pressurization system". An exemption from the 15,000 feet cabin altitude limit would

enable the implementation of a new pressure altitude switch, set at 15,000 feet +/- 300 feet. The new pressure switch would eliminate the possibility of landing pressurized under normal operation. Furthermore, the new pressure switch would preclude the flight crew from receiving a false indication of a loss of cabin pressure control.

The low probability of CPCS failure poses minimal risks to the passengers. The FAA considers the CPCS to be a non-essential system. Non-essential systems are required to be designed for a probability failure range of 1 E-3 to 1 E-5. The CPCS meets this requirement because the system is certified for 1 E-5.

"Exemption from FAR 25.1447(c)(1)

In order to provide service to Bamda, the 757 cabin oxygen system will be modified. This modification would prevent nuisance deployment of the passenger oxygen masks at a cabin internal pressure altitude between 14,000 feet and 15,000 feet. Thus, an exemption from the 15,000 feet altitude limit in FAR 25.1447(c)(l) is requested. The verbatim text of FAR 25.1447(c)(l) is provided:

> 'There must be an oxygen dispensing unit connected to oxygen supply terminals immediately available to each occupant, wherever seated. If certification for operation above 30,000 feet is requested, the dispensing units providing the required oxygen flow must be automatically presented to the occupants before the cabin pressure altitude exceeds 15,000 feet and the crew must be provided with a manual means to make the dispensing units immediately available in the event of failure of the automatic system.'

The proposed new cabin maximum oxygen altitude limit for operation into Bamda is 15,650 feet +/- 350 feet. Granting this exemption will facilitate operation of the 757 airplane at Bamda.

Even if the setting is for 16,000 feet maximum instead of 15,000 feet maximum for automatic oxygen mask deployment during failure of the CPCS, the flight crew can manually deploy the masks to the passengers if necessary. Thus, if passengers require oxygen, the flight crew can provide oxygen manually by over riding the automatic system."

A summary of Boeing's petition was published in the Federal Register on February 17, 1995 (60 FR 9422). No comments were received.

The FAA's analysis/summary is as follows:

The petitioner has requested relief from the maximum cabin altitude limitation of § 25.841(a), which requires that the airplane be able to maintain a cabin pressure altitude of not more than

15,000 feet in the event of any reasonably probable failure or malfunction in the pressurization system. The 15,000 feet cabin pressure altitude limit of the FAR originated in Part 4b, § 4b.374(b), of the Civil Air Regulations (CAR), and was carried over as § 25.841(a) when part 25 was codified.

The FAA has previously certified the Boeing Model 757 airplane with the capability of operating into La Paz, Bolivia, which has an airport altitude of 13,300 feet. This approval required similar equipment modifications to allow the high altitude airport operations. The capability to operate to an airport with an altitude near 15,000 feet is accomplished in part by changing the pneumatic switch that provides a cabin altitude warning at 10,000 feet cabin altitude and automatically drives the pressurization system outflow valve closed in the event of a cabin pressure control system failure. The unmodified system would not allow a landing at the high altitude airport because the system would automatically try to prevent excessive cabin altitudes after the cabin altitude reaches 10,000 feet, as required by § 25.841. The modified system changes the cabin altitude at which the cabin altitude warning is provided and the signal to close the outflow valve occurs. However, the change in the pneumatic pressure switch set point does not occur until the airplane begins its descent into the high altitude airport, and the set point is reset after the airplane departs the high altitude airport. Under all other conditions, the pressurization control system performs identically to that found on the standard 757 airplane. Thus, the cabin altitude follows the normal profile during all operations, except when the airplane is landing at or departing from the high altitude airport, with a minimum change in protection. In addition, the flightcrew retains the capability to control the pressurization system manually in the event of a system failure. The flightcrews operating into Bangda will have special training to ensure that the pressurization system is operating normally, and will also be trained as to appropriate actions in the event of a failure. In light of the above, the FAA has determined that the modified system provides the level of safety intended by the regulations.

In addition, the petitioner has requested an exemption from the requirement of § 25.1447(c)(1), which states that oxygen dispensing equipment for occupants must be automatically presented before the cabin altitude reaches 15,000 feet. This requirement originated in § 4b.651(d)(3)(i) of the CAR and was carried over as § 25.1447(c)(1) when part 25 was codified. The requirement that the oxygen equipment be automatically presented before the cabin altitude reaches 15,000 feet was added at Amendment 25-41, effective September 1, 1977.

In order to operate into the airport at Bangda, China, which has an altitude of 14,219 feet, the pressure switch must be changed. Because of the tolerances in the switch, the existing device would occasionally trigger the dropping of the masks even though the cabin altitude is still under 15,000 feet. A new pressure switch, set at 15,650 feet +/- 350 feet, will allow the airplane to land at Bangda without dropping the masks. The flightcrew retains the capability of deploying the masks using the manual control in the cockpit. The FAA has determined that, for operation into this airport, this system provides the level of safety intended by the regulations. As in the case of the cabin pressure warning switch, the system operates normally except when operating into the high altitude airport.

In conclusion, the FAA has determined that the changes to the cabin pressure control system to enable the airplane to operate into Bangda, China, will allow the Boeing 757 to safely serve this high altitude airport while still complying with the intent of the regulations. When operating into airports that do not require these design modifications, the pressurization system and oxygen system will continue to operate as do those on the airplanes which have not had the systems modified.

In consideration of the foregoing, I find that a grant of exemption is in the public interest and will not affect the level of safety provided by the regulations. Therefore, pursuant to the authority contained in §§ 313(a) and 601(c) of the Federal Aviation Act of 1958, delegated to me by the Administrator (14 CFR 11.53), Boeing is hereby granted an exemption from the cabin pressure altitude limit requirement of § 25.841(a), and the § 25.1447(c)(1) requirement that the passenger oxygen masks be automatically presented before the cabin pressure altitude exceeds 15,000 feet, for Boeing Model 757-200 series airplanes operating into Bamda, China.

This exemption will remain in effect unless superseded or rescinded.

Issued in Renton, Washington, on April 26, 1995.

/s/ Ronald T. Wojnar,
Manager, Transport Airplane Directorate, ANM-100